

WAR DEPARTMENT TECHNICAL BULLETIN

HEALTH HAZARDS FROM INDUSTRIAL SOLVENTS

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SECTION I

GENERAL INFORMATION

1. Industrial solvents are widely used by military personnel in many operations, such as degreasing, spray painting, dry cleaning, paint removing, rustproofing, and impregnating.
2. The principal mode of entry into the body is by inhalation; however, many of these solvents can be absorbed through the skin in amounts sufficient to cause intoxication. In addition, continued skin contact with most solvents will, by defatting the skin, produce a dermatitis. The respiratory tract is also irritated by many solvents.
3. The liver and/or the blood-forming organs are unduly susceptible to these compounds. Renal disease and cardiac failure is a complication in some of these cases.
4. INTOXICATION BY SOLVENTS MAY BE ACUTE OR CHRONIC.—*a. Acute intoxication.*—The fulminating type is observed where persons are exposed to exceedingly high concentrations of vapor or mist and present the clinical picture of narcosis or asphyxiation. Such cases are not frequently observed in industrial activities.

(2) The insidious form is associated usually with the exposure to relatively low concentrations over a considerable period of time. The symptoms vary, but in general, those related to nervous system effects are headache, giddiness, drowsiness, fatigue, insomnia, tremor and paraesthesias, and convulsions; and those related to the gastrointestinal tract are anorexia, nausea, vomiting, diarrhea or constipation, and enlarged and tender liver with excessive blood bilirubin. In other instances where the blood-forming organs are particularly affected, aplastic anemia develops and purpuric manifestations are observed. In women menorrhagia may occur. It is evident that the symptoms enumerated are characteristic of many intoxications. Therefore, differential diagnosis is the important feature. Failures in diagnosis are usually attributable to the fact that the physician

is unaware of exposure to the solvents. The transition from acute to subacute and chronic conditions is not easily discernible.

b. Chronic intoxication.—The clinical manifestations of subacute or chronic intoxication vary more widely than do the manifestations of acute intoxication, and in many instances, they are characteristic of the type of solvent to which the individual is exposed. Examples of common clinical characteristics are as follows:

(1) *Chlorinated hydrocarbons.*—Symptomatology is referable, particularly to liver injury, so that one may have jaundice, liver enlargement and tenderness. The prognosis is poor. Certain individuals may be apparently cured and subsequently present manifestations of liver cirrhosis. Renal manifestations may occur also.

(2) *Benzol (benzene—not benzine).*—This affects particularly the blood-forming organs with resulting anemia of the aplastic type, together with resulting complications. The clinical picture is frequently confused with pernicious anemia. It is possible that toluene and xylene may produce the same effects.

(3) *Petroleum products.*—Alcohols, ethers, ketones, esters, and aldehydes are noted for their narcotic effect. In rare instances, severe constitutional diseases may result from absorption of these solvents. In general, however, these compounds are much better tolerated than those just described.

SECTION II

PREVENTIVE MEASURES

5. The surgeon should familiarize himself with industrial operations on his post, and acquaint himself with the type of solvents in use and the nature of their toxic action. Many solvents are mixtures, and many are sold under trade names which do not indicate their composition. Information on the composition of these mixtures may be obtained by referring specification numbers to the Office of The Surgeon General or the manufacturer, and by analyses of these solvents.

6. Eliminate the hazard by substituting less toxic solvents where possible.

7. The degree of exposure should be determined, as well as the concentration of solvent vapors in the air.

8. Skin contact should be prevented as much as possible by the use of impervious gloves, sleeves, and aprons. The provision of adequate washing facilities is most important. Grease-removing soaps should be used for skin-cleansing purposes; solvents for skin-cleansing purposes should be prohibited.

9. Inhalation of solvent vapors should be prevented. The most effective method of preventing inhalation of vapors is by the use of local exhaust ventilation wherever practicable. The operator should not be between the source of the vapor and the exhaust ventilation port. When a ventilating system is neither practicable nor available, the work should be done outdoors. The operator should be in a position so that the prevailing wind carries the vapors away from him, not toward him. Personal protection devices, such as proper respirators, may be used for intermittent exposures. Cartridge-type respirators approved by the United States Bureau of Mines may be used only for short exposures to low concentration, and cartridge changes should be frequent and according to manufacturers' instructions. Supplied air respirators are preferable. The vapor density of many of these solvents is greater than air, but due to the influence of air currents, ventilation requirements are the same as for all vapors and gases.

10. The time of exposure should be reduced, and the rotation of workers should be done when other methods are not applicable.

11. Fire and explosive hazards in the use of solvents should always be considered.

12. Preplacement medical examination should be made, and persons who have a history of previous anemia, hepatic and gall bladder disease, syphilis, diabetes or chronic cardiac, and renal disease should not be employed to handle solvents. This rule applies also to obese individuals and alcoholics.

13. Workers should be instructed about the hazards associated with exposures to solvents and the precautionary measures for the prevention of intoxication.

14. PERIODIC MEDICAL EXAMINATIONS.—Frequency with which these examinations are made will have to be determined by the nature of the work, as well as the type of solvent to which individuals are exposed. Some system should be established to keep accurate records of individuals having complaints described in paragraph 4, section I.

15. LABORATORY EXAMINATIONS.—The type of laboratory work will depend also upon the type of solvent to which individuals are exposed. For those that affect the liver, examination of blood and urine with respect to bile pigments should be made. In those instances which involve the use of solvents affecting the blood-forming organs, detailed examination of the blood should be made.

16. Specific information regarding various aspects of the engineering and medical control measures may be obtained from the Office of The Surgeon General or the Army Industrial Hygiene Laboratory, 615 N. Wolfe Street, Baltimore, Md.

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BY ORDER OF THE SECRETARY OF WAR:

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